CLAIMS

We claim:

1. An apparatus for communicating radio frequency (RF) informational signals having a RF power level, through an optical link medium, said apparatus comprising:

a first conductor adapted to carry said informational signals as electrical signals into the apparatus;

a RF level sensor operatively coupled to the first conductor, adapted to measure the RF power level and to output a control signal according to said RF power level;

a first RF attenuator adapted to be operatively controlled by the control signal, and adapted to attenuate the electrical signals from the first conductor prior to being communicated through said optical link medium;

a transmitter adapted to transmit the electrical signals as optical signals into the optical link medium;

a receiver adapted to receive the optical signals from the optical link medium, said receiver being operatively coupled to a second conductor adapted to carry said informational signals as electrical signals out of the apparatus.

2. The apparatus of claim 1 further comprising a first RF amplifier adapted to be operatively controlled by the control signal, and adapted to amplify the electrical signals from the first conductor prior to being communicated through said optical link medium.

3. The apparatus of claim 2 wherein the control signal is communicated though said optical link medium, and further comprising a second RF attenuator operatively coupled to the receiver and adapted to be operatively controlled by the encoded control signal, and adapted to attenuate the electrical signals on said second conductor.

4. The apparatus of claim 3 wherein the second RF attenuator is adapted to attenuate the electrical signals on said second conductor to within ± 0.5 dB of the RF power level.

5. The apparatus of claim 3 wherein the second RF attenuator is adapted to attenuate the electrical signals on said second conductor to approximately the RF power level.

6. The apparatus of claim 2 wherein the control signal is communicated though said optical link medium, and further comprising a second RF attenuator operatively coupled to the receiver and adapted to be operatively controlled by the encoded control signal, and adapted to attenuate the electrical signals on said second conductor, and further comprising a second RF amplifier operatively coupled to the receiver and adapted to be operatively controlled by the control signal, and adapted to amplify the electrical signals on said second conductor.

7. The apparatus of claim 1 wherein the control signal is communicated though said optical link medium, and further comprising a second RF amplifier operatively coupled to

the receiver and adapted to be operatively controlled by the control signal, and adapted to amplify the electrical signals on said second conductor.

8. The apparatus of claim 7 wherein second RF amplifier is adapted to amplify the electrical signals on said second conductor to within ± 0.5 dB of the RF power level.

9. The apparatus of claim 7 wherein second RF amplifier is adapted to amplify the electrical signals on said second conductor to approximately the RF power level.

10. An apparatus for enhancing the dynamic range of an optical transmission system, the optical transmission system including a RF transmitter for transmitting digital signals, an RF receiver for receiving the digital signals, and an optical link operatively connecting the RF transmitter to the RF receiver, the apparatus comprising:

an RF sensor adapted to measure the power level of RF digital signals to be transmitted by the RF transmitter, the RF sensor having a sensor output corresponding to said power level;

a first RF attenuator operatively coupled to the RF sensor and adapted to attenuate the RF digital signals prior to being transmitted by the RF transmitter, wherein the attenuation performed by the first RF attenuator corresponds to the sensor output.

11. The apparatus of claim 10, wherein the sensor output is adapted to be transmitted to the RF receiver.

12. The apparatus of claim 11, further comprising a second RF amplifier operatively coupled to the RF receiver, and adapted to amplify the digital signals, wherein the amplification performed by the second RF amplifier corresponds to the sensor output.

13. The apparatus of claim 12, further comprising a second RF amplifier operatively coupled to the RF receiver, wherein during operation of the apparatus the magnitude of

the amplification performed by the second RF amplifier is approximately the same as the magnitude of the attenuation performed by the first RF attenuator.

14. The apparatus of claim 10, further comprising a first RF amplifier operatively coupled to the RF sensor and adapted to amplify the RF digital electrical signals prior to being transmitted by the RF transmitter, wherein the amplification performed by the first RF varies inversely with the sensor output.

15. The apparatus of claim 14, wherein the sensor output is transmitted to the RF receiver, and further comprising a second RF attenuator operatively coupled to the RF receiver, and adapted to attenuate the received digital signals, wherein the attenuation performed by the second RF attenuator varies inversely with the sensor output.

16. The apparatus of claim 14, further comprising a second RF attenuator operatively coupled to the RF receiver, wherein during operation of the apparatus the magnitude of the attenuation performed by the second RF attenuator is approximately the same as the magnitude of the amplification performed by the first RF attenuator.

17. An optical transmission system comprising:

an optical signal transmitter section;

an optical signal receiver section;

an optical link medium being operatively connected between the optical signal transmitter section and the optical signal receiver section to form an included transmission system having a dynamic range;

an RF stabilization system operationally connected to said transmitter section and to a first conductor carrying in an RF signal having a first RF power level;

an RF stabilization system operationally connected to said receiver section and to a second conductor carrying out the RF signal at a second RF power level;

wherein the RF stabilization systems operate to make the effective dynamic range of the apparatus substantially wider than the dynamic range of the included transmission system.

18. The optical transmission system of claim 17, wherein the RF stabilization systems maintain the second RF power level within ± 0.5 dB of the first RF power level.

19. The optical transmission of claim 10, wherein the optical transmission system is a cable television (CATV) system.

20. An apparatus for enhancing the dynamic range of an optical transmission system, the optical transmission system including an RF transmitter for transmitting digital signals, an RF receiver for receiving the digital signals, and an optical link operatively connecting the RF transmitter to the RF receiver, the apparatus comprising:

an RF sensor adapted to measure the power level of RF digital signals to be transmitted by the RF transmitter, the RF sensor having a sensor output corresponding to said power level, wherein the sensor output is adapted to be transmitted to the RF receiver;

a RF attenuator operatively coupled to the RF sensor and adapted to attenuate the RF digital signals prior to being transmitted by the RF transmitter, wherein an attenuation performed by the RF attenuator is greater when the measured power level is higher than the dynamic range than when the measured power level is within the dynamic range;

and a RF amplifier operatively coupled to the RF receiver and adapted to amplify the digital signals, wherein during operation of the apparatus the magnitude of the amplification performed by the RF amplifier is approximately the same as the magnitude of the attenuation performed by the RF attenuator.

21. A method for enhancing an effective dynamic range of an optical transmission system including a transmitter, an optical link, and a receiver, and for transmitting RF electronic signals as light signals through the optical link to the receiver that outputs the light signals as transmitted RF electronic signals, the method comprising:

measuring a first RF power level of the RF electronic signals to be transmitted;

transforming the RF electronic signals to a transformed RF power level before the RF electronic signals are transmitted as light signals by the transmitter; and

outputting the transmitted RF electronic signals at within ± 0.5 dB of the first RF power level.

22. The method of claim 21, wherein the noise power ratio (NPR) of the transmitted RF electronic signals is greater than it would be if such transforming had not been performed

23. The method of claim 22, wherein said transforming is attenuating, and said transformed RF power level is less than the first RF power level.

24. The method of claim 22, wherein said transforming is amplifying, and said transformed RF power level is greater than the first RF power level.

25. The apparatus of claim 22, wherein the RF electronic signals are cable television (CATV) signals.

26. A method for communicating radio frequency (RF) informational signals having a RF power level, through an optical link medium, said method comprising:

providing a first conductor adapted to carry said informational signals as electrical signals into the apparatus;

providing a RF level sensor operatively coupled to the first conductor, adapted to measure the RF power level and to output a control signal according to said RF power level;

providing a first RF attenuator adapted to be operatively controlled by the control signal, and adapted to attenuate the electrical signals from the first conductor prior to being communicated through said optical link medium;

providing a transmitter adapted to transmit the electrical signals as optical signals into the optical link medium;

providing a receiver adapted to receive the optical signals from the optical link medium, said receiver being operatively coupled to a second conductor adapted to output said informational signals as electrical signals; and

outputting said electrical signals at said second conductor at ± 0.5 dB of the RF power level.